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DEVONIAN CORALS FROM WARATAH BAY, VICTORIA

By Dorothy Hill*

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Abstract

Rugosa and Tabulata from the disconnected fault slices of Waratah Bay are illustrated, and two new species and one new variety of Rugosa are described. All are Devonian, and all but the new forms are known from other Devonian limestones of Victoria. There is closer similarity to the Lilydale and Loyola faunas, whose precise position in the Devonian is uncertain, than to the Couvinian Buchan fauna.

The material described herein is from the collections of A. W. Lindner and O. P. Singleton, of C. Teichert (Melbourne University) and of the National Museum, Melbourne. The corals are from several localities separated one from another or from early Palaeozoic rocks by faults, the structural relations being described by Lindner (1952) and Teichert (this journal).

Bell Point

The Bell Point fauna has the greatest variety of Rugosa, predominantly members of the family Phillipsastreidae. Of these, *Hexagonaria* aff. *approximans* (Chapman), which occurs also at the base of the Bluff Member of Teichert south of the Bluff, differs slightly from the type specimen from Cooper's Creek, Thomson River, Victoria, and of overseas species is perhaps closest to *H. sedgwicki* (Edwards and Haime) of Ma (1937, Pl. iii, figs. 3a, b) from the ?Middle Devonian of Iowa, U.S.A. *H. stevensi* (Chapman) is known elsewhere only from the Lilydale limestone, regarded as Lower Devonian or doubtfully Middle Devonian. *Disphyllum ?goldfussi* Geinitz is not very different from typical specimens from the Givetian and Frasnian of N.W. Europe and the Givetian of the Kimberleys, Western Australia. *Mictophyllum cresswelli* (Chapman) is known also 200 yards west along the coast from Mushroom Rock (WB6) and near the edge of the Devonian belt west of Mushroom Rock (WB17), as well as from its type locality in the Lilydale limestone. Overseas, *Mictophyllum* is best developed in the upper Devonian of Canada. *M. cresswelli* var. *cylindricum nov.* recalls the species *angulare* Hill from the Couvinian Murrindal Beds of Buchan referred by Hill (1950) to *Disphyllum*. The new variety occurs also near the edge of the Devonian belt west of Mushroom Rock and somewhat below the ostracod limestone south-east of Hughes Jetty. Of the remaining members of the fauna *Tryplasma murrayi* Etheridge is not known elsewhere; this genus is not known in rocks younger than Couvinian. *Favosites goldfussi* d'Orbigny is a common and cosmopolitan Lower and Middle Devonian species, while *F.* aff. *bryani* from south of Bell Point has some of the characters of *F. nitidus* and indicates the Lower or lower Middle Devonian. *Syringopora flaccida* Hill occurs also near the edge of the Devonian Belt west of Mushroom Rock, and in the Cave Limestone (?early Couvinian) fauna of Buchan. The age of the Bell Point fauna is thus Devonian, possibly Couvinian.

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*University of Queensland.

The small collections from WB6 (200 yards west along the coast from Mushroom Rock—*M. cresswelli* and *F.* aff. *bryani*) and WB17 (near edge of Devonian belt, west of Mushroom Rock—*M. cresswelli* and var. *cylindricum, Favosites* sp. and *Syringopora flaccida*) clearly are equivalent to at least part of the Bell Point fauna above, as is the fauna WB14 from somewhat below the ostracod limestone south-east of Hughes Jetty with *M. cresswelli* var. *cylindricum, M.* sp., *Disphyllum ?goldfussi, D.* sp., *Favosites* aff. *bryani* and *Aulopora* cf. *conglomerata* Goldfuss.

Old Kilns

The Kiln fauna from Station G of Teichert on the north side of the Old Kilns (WB4) contains *Lyrielasma ?subcaespitosum* (Chapman) in common with the Bird Rock Fauna, a species known elsewhere from Lilydale and Loyola, *?Pseudamplexus* sp. (a genus fairly characteristic of the Lower Devonian), *F. goldfussi, Alveolites ?stamineus* Hill, a species typical of the Couvinian upper Murrindal beds of Buchan, and *Heliolites* sp. This fauna, which occurs in beds mapped by Teichert as the Kiln member of the Bell Point Limestone, is thus Devonian, possibly Lower or Lower Middle Devonian.

Bird Rock

The Bird Rock fauna has *Mictophyllum* (or *Disphyllum*) sp., *Lyrielasma ?subcaespitosum* (in common with the Kiln fauna), *Spongophyllum serratum* Hill, unknown elsewhere but of overseas species closest to *S. sedgwicki* Edwards and Haime from the Middle Devonian (possibly Givetian) of Europe and to *S. ligeriense* Le Maitre (1934) from the French Chalonnes limestone thought to be Lower Couvinian (Assise de Bure), and *Tryplasma wellingtonense* Etheridge known from an unplaced horizon in the Wellington district of N.S.W., and *Tryplasma* sp. This fauna is rich in Tabulata, with *F. goldfussi, F. ?ovatiporus* Hill and Jones, ? var. (typical specimens being known from the Lower Devonian Garra beds of N.S.W. and from Loyola in Victoria), *Thamnopora angusta* Lecompte known elsewhere from the Givetian of Belgium and Western Australia, *?T.* sp., *?Striatopora* sp., *Heliolites daintreei* Nich. and Eth. (the common Silurian and Lower Devonian species), *S. flaccida* and *Aulopora* cf. *conglomerata*. The age of the Bird Rock Fauna which occurs in Teichert's Bird Rock member of the Bell Point Limestone is thus Devonian, either late Lower Devonian or early Middle Devonian.

Liptrap Formation

A small fauna P.14 from mudstones with plants towards Cape Liptrap is *Phillipsastrea maculosa* Hill, known also from the ?Lower Couvinian Sulcor Limestone of N.S.W. and the ?Lower Devonian Loyola Limestone of Victoria, *Heliophyllum pinguiseptatum* nov., not dissimilar from *H. halli* of the Onondagan and Hamilton of North America and the Upper Couvinian of Morocco, and *Favosites* aff. *bryani*. This fauna appears to be late Coblenzian or early Couvinian.

Point Grinder

At Point Grinder, *Favosites nitidus* Chapman occurs in beds regarded by Lindner as of the Bell Point Limestone; it is known elsewhere from the Coblenzian Garra beds of N.S.W. and from Cooper's Creek and Deep Creek, Victoria.

The Waratah Bay fauna taken as a whole is thus close to the Lilydale and Loyola faunas, but also has some members of the Buchan faunas. The problem of the relative ages of these faunas is a very interesting one, which will not yet, apparently, be satisfactorily solved by a study of the corals alone. Some differences may possibly be due to facies or province rather than age.

Description of Species

Order RUGOSA

Suborder STREPTELASMATINA Wedekind, 1927

Superfamily STREPTELASMATICAE

Family PHILLIPSASTREIDAE Römer, 1883

Genus **Phillipsastrea** d'Orbigny, 1849; Hill, 1939, p. 236

Prantl (1951) has given a helpful discussion of Devonian thamnastraeoid corals.

Phillipsastrea maculosa Hill, 1942, p. 153. (Pl. VI, figs. 1a, 1b)

Astraeoid or partly thamnastraeoid *Phillipsastrea* with tabularia about 3 mm. wide and 10-15 mm. apart from axis to axis, surrounded by a zone of thickened septa about 2 mm. wide and by a peripheral zone wherein the septa are thin and irregularly carinate; the dissepimentarial floors are arched in the zone of thickened septa, but are declined to the periphery outside this; the tabular floors are horizontal.

One specimen from the mudstones with plants towards Cape Liptrap belongs to this species, previously known from the ?Lower Couvinian Sulcor Limestone of Sulcor Quarry, Tamworth district, N.S.W., and from the ?Lower Devonian Loyola Limestone of Griffiths Quarry, Loyola, Victoria.

Genus **Hexagonaria** Gürich, 1896; Hill, 1953

Hexagonaria stevensi (Chapman). (Pl. VI, figs. 2a, 2b)

Spongophyllum stevensi Chapman, 1925, p. 113.
Prismatophyllum stevensi (Chapman), Hill, 1939, p. 231.

One specimen from Bell Point, Waratah Bay, is referable to this species, known elsewhere only from Mitchell's Quarry, Cave Hill, Lilydale.

Hexagonaria approximans (Chapman). (Pl. VI, figs. 3a, 3b)

Cyathophyllum approximans Chapman, 1914, pl. xlvii.
Prismatophyllum approximans (Chapman); Hill, 1939, p. 234.

Holotype. Nat. Mus. Melb. 1247, Cooper's Creek, Thomson River, Victoria.

Hexagonaria in which the calical profile has a broad humped border and an axial boss; septal trabeculae diverge from near inner edge of dissepimentarium.

Description. The corallites of the cerioid corallum are polygonal, mainly hexagonal, averaging 10 mm. in diameter from angle to angle; in corallites of this size there are 17 or 18 septa to each order, the major extending to an axial boss of tabellae, or to the axis, and the minor to the inner edge of the dissepimentarium, which is 3 to 4 mm. wide; the septa may be thickest near the inner edge of the dissepimentarium, thinning towards both axis and periphery; they may be carinate, with either cross-bar or zig-zag carinae, and there may be an area of divergence in the trabeculae near the inner margin of the dissepimentarium. The dissepiments are small and rather globose, and in parts of many corallites the outermost three or four series are inclined slightly towards the periphery, while the innermost are inclined steeply towards the axis. The axial tabellae form a boss, and the periaxial are inclined from this towards the dissepimentarium. Both dissepiments and tabellae are thin. The tabularium is 2 to 3 mm. wide.

This species is known at present only from the holotype, so its limits of variation are not defined. Of foreign species it is closest to that illustrated by Ma (1937, pl. iii, figs. 3a, b) as *P. sedgwicki* Edwards and Haime from the ?Middle Devonian of Iowa, U.S.A.

Hexagonaria aff. **approximans** (Chapman). (Pl. VI, figs. 4a, 4b)

Two specimens from Waratah Bay show certain resemblances to *H. approximans*, and are herein named *H.* aff. *approximans*. These are UQ F17115* from Bell Point and MU 2035 from the base of the *Amphipora* Limestone (Bluff Member of Bell Point Limestone) south of Bluff. Of these UQ F17115 differs in having larger corallites, 12 mm. in diagonal diameter, with 20 or 21 septa of each order; also, in some of its septa the carinae may bend along the sides to form a network as seen in transverse section, and the septa tend to be reinforced or replaced peripherally by naotic dissepiments. MU 2035 has still larger corallites, up to 15 mm. in diagonal diameter, though numbers of small, new corallites occur between these large ones; also, some septa may have very notable cross-bar carinae.

Genus **Disphyllum** de Fromentel, 1861

Disphyllum ?**goldfussi** (Geinitz, 1845). (Pl. VI, figs. 5a, 5b)

One specimen, NM P15405-6, from the '*Palaeosolen*' band of Bell Point may belong to this cosmopolitan, characteristic, Middle Devonian phaceloid species; it is somewhat atypical in having considerable septal dilatation, particularly at the inner edge of the dissepimentarium, and in having the axial edges of the major septa somewhat dilated and stopping short of the axis to form a rather wide axial space.

Disphyllum sp. (Pl. VI, figs. 6, 7)

Several fragments of cylindrical corallites suggesting derivation from phaceloid coralla occur somewhat below the ostracod limestone south-east of Hughes Jetty, Waratah Bay. Whether these are all of one species is doubtful, but all seem referable to *Disphyllum*. Three are figured herein.

One, MU 2025, is slender, 9 mm. in diameter with 28 major and 28 minor septa, the latter extending to the inner edge of the 2 mm. wide dissepimentarium, and the former extending unequally partway to the axis; the septa thin towards the inner edge of the dissepimentarium but are thicker again in the tabularium; the dissepiments are small and globose and the tabellae are in two irregular series, the outer inclined and the inner horizontal. A second, MU 2026, is 10 mm. in diameter, with 26 major and 26 minor septa, most of the latter extending to the inner edge of a dissepimentarium 2 to 4 mm. wide, the former extending unequally into the tabularium partway to the axis. The third, MU 2027, is 12 mm. in diameter and shows greater septal dilatation in the dissepimentarium than either of the others.

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*UQ F refers to catalogue numbers of the University of Queensland, MU to those of Melbourne University, NM to those of the National Museum, Melbourne.

Genus **Mictophyllum** Lang and Smith, 1939; Smith, 1945, p. 30

Mictophyllum cresswelli (Chapman), Hill, 1939, p. 246. (Pl. VII, figs. 8a, 8b)

Several large trocho-cylindrical corallites from the Bell Point Limestone of Bell Point, and from near the edge of the Devonian belt west of Mushroom Rock, seem conspecific with those figured Hill, 1939, pl. XIV, figs. 7-9, from the Lilydale Limestone. The Bell Point specimens are weakly compound, large, trochocylindrical of cylindrical offsets appearing by peripheral increase, but none of them show any considerable stereozone like the Lilydale specimen figured Hill, 1939, pl. XIV, figs. 10-11; the diameter of the Bell Point specimens varies, up to 32 mm., and the number of septa seems smaller, 30-33 as against 35 of each order in the Lilydale specimen; also, the minor septa of the Bell Point forms are withdrawn further towards the periphery.

Mictophyllum cresswelli (Chapman) var. **cylindricum** nov.
(Pl. VII, figs. 9a, 9b)

Holotype: MU P4, Bell Point, Waratah Bay.

M. cresswelli with cylindrical corallites up to 18 mm. diameter and with a central down-sinking in the tabular floors.

Description. The corallites are cylindrical (conical at the beginning) and by their apposition suggest that they may be weakly compound, arising by lateral increase. The average diameter of the cylindrical adult portion is 18 mm., with 27 to 30 septa of each order, the major extending unequally and wavily almost to the axis, but typically leaving a space there; the minor are short and may be a little withdrawn from the inner edge of the dissepimentarium, which is 3 to 5 mm. wide; both orders of septa are slightly wavy and somewhat dilated at the periphery and in the dissepimentarium, becoming attenuate axially. The dissepiments are either normal concentric or angular, inosculating; those at the periphery are thickened, the dilatation being in continuity with that of the septa. The tabellae are thin, forming horizontal floors typically with an axial down-sinking in the space free of axial septal ends.

This variety is known so far only from Bell Point and from somewhat below the ostracod limestone south-east of Hughes Jetty.

Mictophyllum sp. (Pl. VII, figs. 10a, 10b)

Two specimens from somewhat below the ostracod limestone south-east of Hughes Jetty, Waratah Bay.

The fragments are cylindrical corallites possibly from phaceloid coralla, with broad low interseptal ridges and narrow septal grooves; diameter 14 mm.; the 26 major and 26 minor septa are dilated, the dilatation decreasing towards the inner edge of the dissepimentarium; the minor septa may be withdrawn somewhat from the inner edge of the dissepimentarium; the major septa may continue unequally to or almost to the axis, with or without waving or curving, and may be more dilated in the tabularium than at the inner edge of the dissepimentarium, while their segments in the tabularium may be discontinuous from their dissepimentarial parts. The dissepiments are small or moderately globose, concentric or inosculating, and when dilated their dilating tissue is continuous with that of the septa. The tabulae are concave.

The relations of these two specimens are uncertain; the inosculating dissepiments and dilated septa suggest *Mictophyllum,* and the thickening of the tabularial segments of the major septa is like that seen in the Canadian Upper Devonian *M. semidilatum* Smith (1945, p. 31); but I am uncertain whether they form a new species or are referable to *M. cresswelli* var. *cylindricum*. Also, the suggestion of a phaceloid growth form may indicate *Disphyllum* as a more appropriate genus.

Mictophyllum sp. or **Disphyllum** sp. (Pl. VII, fig. 11)

Four fragments of small corallites from the Bird Rock Member of the Bell Point Limestone, north of Bird Rock, Waratah Bay.

The corallites are not more than 11 mm. in diameter at the upper calical edge, and up to 9 mm. at the floor of the calice, which is steep-sided and deep. There are 25 to 27 major septa with an equal number of alternating minor septa; all are dilated to contiguity at the periphery, and the stereozone so formed may be 1·5 mm. wide; in parts of some corallites the dilatation is not complete in the inner half of the minor septa, so that small interseptal dissepiments develop. The major septa are attenuate in the tabularium and considerably withdrawn from the axis, and may be curved. The tabulae appear from the transverse sections (no vertical sections are possible from the material) to be in two series, an outer of inclined angulate plates and an inner of flat plates.

The generic position of these fragments is uncertain; if they are solitary they are probably best referred to *Mictophyllum*; if parts of fasciculate coralla, these would be *Disphyllum*.

Another corallite of 12 mm. diameter at the base of the calice, from Bell Point, has its 1 mm. wide dissepimentarium developed as a stereozone due to the dilatation therein of the 23 major and minor septa; the major septa continue unequally and with curvature to the axis, but are attenuate in the wide tabularium. This fragment could conceivably be the young of *M. cresswelli* or *M. cresswelli* var. *cylindricum*.

Family ZAPHRENTIDAE Edwards and Haime, 1850

Genus **Heliophyllum** Hall in Dana, 1846

Heliophyllum pinguiseptatum sp. nov. (Pl. VII, figs. 12a, 12b, 12c)

Holotype. MU 2042, mudstones with plants towards Cape Liptrap, Waratah Bay, Victoria. This is the only specimen known.

Heliophyllum with a wide tabularium in which the long major septa are much dilated.

The corallum is large, apparently solitary, slowly expanding and slightly curved. At a diameter of 35 mm. there are 46 major and 46 minor septa, the latter confined to a narrow dissepimentarium not more than 7 mm. wide; in the dissepimentarium both orders of septa have thick, bulbous yard-arm carinae, from which they attenuate rapidly towards the next inner carina; in vertical section, these carinae appear as thick upwardly and inwardly directed trabeculae; in the tabularium the major septa extend unequally to the axis and are so dilated as to be almost or quite contiguous; a cardinal fossula is visible in the tabularium, closed but expanded inwardly. The dissepiments are small and globose and some series are dilated. The tabulae are sub-horizontal, some dilated, but all of poor development owing to the great thickening of the major septal ends.

This species differs from the North American and Moroccan Couvinian *H. halli* by the persistence of the dilatation of the long major septal ends in the tabularium, by the great width of the latter, and the relatively narrow dissepimentarium. This is the first recorded occurrence of this American and Moroccan genus in Australia. In many coral lineages dilatation of the septa is an early feature.

Family MUCOPHYLLIDAE Hill, 1940

Genus **Pseudamplexus** Weissermel, 1897; Hill and Jones, 1940

?**Pseudamplexus** sp. (Pl. VII, figs. 13a, 13b)

One fragment of a small cylindro-conical corallum is from the Kiln Member of the Bell Point Limestone from Station G, north side of Old Kilns, Waratah Bay. The size is much smaller than that typical of the genus, and the characteristic stereozone relatively wider, but the occasional blunt spines projecting inwards from the axial septal edges and the flat tabulae are quite characteristic. Occasional interseptal spaces develop. No known Australian species of the genus has such a small diameter. *P. princeps,* the characteristic large Australian species, is typically Lower Devonian.

Suborder COLUMNARIINA Soshkina, 1947

Family ACANTHOPHYLLIDAE Hill, 1939

Genus **Lyrielasma** Hill, 1939

Lyrielasma ?subcaespitosum (Chapman, 1925). (Pl. VII, figs. 14a, 14b)

Fragments of erect and tapering corallites with internal structure very similar to that of individual corallites of *L. subcaespitosum* are known from Cave Hill, Lilydale (Hill, 1939, p. 244) and from Waratah Bay at two localities in the Bell Point Limestone, north of Bird Rock in the Bird Rock Member, and north side of Old Kilns, in the Kiln Member. One cannot be sure that these fragments are of solitary corals or of individual from phaceloid coralla; I suspect the latter since one of the fragments (UQ F17101) shows two young offsets in its calice. They differ from individual corallites of *L. subcaespitosum* only in their peripheral stereozone being narrower and more regular, and in their septa inside this stereozone being thinner; but these characters are seen in one individual in the holotype of *L. subcaespitosum* and also characterize most of the individuals in a large phaceloid corallum collected by F. S. Colliver at Griffith's Quarry, Loyola (UQ F12577). Of foreign species they closely resemble *Cyathophyllum elongatum* Le Maitre (1934, pl. V, figs. 10-12) from the Chaudefonds Limestone of France, which is regarded as a Hercynian facies of horizon equivalent to the *Spirifer cultrijugatus* beds, i.e. early Couvinian.

Family SPONGOPHYLLIDAE Dybowski, 1873

Genus **Spongophyllum** Edwards and Haime, 1851; Hill, 1942, p. 254

Spongophyllum serratum sp. nov. (Pl. VIII, figs. 15a, 15b)

Holotype. UQ F17100, north of Bird Rock, Waratah Bay, Victoria, Devonian.

Cerioid *Spongophyllum* with 16 major septa; minor septa only as ridges on the thickened wall, which appear serrated where lonsdaleoid dissepiments are developed.

Description. The corallum is cerioid and the corallites are up to 5 or 6 mm. in diameter, three- to eight-sided; some of the sides may be slightly curved in transverse section. There are 16 major septa in the larger corallites, extending unequally towards the axis, and somewhat wavy, particularly in the tabularium, where they may be irregularly carinate, the carinae appearing in vertical sections as upwardly projecting thorns; in some corallites one septum may be longer and slightly thicker axially than the others; some or all may be separated from their peripheral bases by one or at most two series of lonsdaleoid dissepiments; at the periphery the septa are thickened to contiguity, forming a narrow stereozone. Minor septa are represented usually only by their bases at the wall, but occasionally segments may be seen within the dissepimentarium. When lonsdaleoid dissepiments develop, the thick wall appears serrated in transverse section because the septal bases project inwards from it; lonsdaleoid dissepiments are thickened only very rarely and slightly. The tabularium is up to 2 mm. wide; the tabulae are complete, slightly sagging and rather distant. Many dissepiments are lonsdaleoid; others may be curved, geniculate or inosculating between neighbouring major septa.

Remarks. Fragments of the holotype only are known. Of the various species of *Spongophyllum* this is perhaps closest to the genotype *S. sedgwicki* from the Middle Devonian of Europe, to *S. ligeriense* Le Maitre (1934) from the French Chalonnes Limestone thought to be of the age of the Assise de Bure, i.e. Lower Couvinian, and to *S. shearsbyi* Etheridge from the Wenlockian of Yass. N.S.W.

Suborder CYSTIPHYLLINA Wedekind, 1927

Family TRYPLASMATIDAE Etheridge, 1907

Genus **Tryplasma** Lonsdale, 1845

Tryplasma wellingtonense Etheridge, 1895, p. 160; 1907, p. 89. (Pl. VIII, figs. 16a, 16b)

Solitary, conical at first, then cylindrical, with repeated rejuvenescence sometimes causing slight change in direction of growth, attaining a diameter of 15 mm. or more; septal furrows very faint or absent, the epitheca being marked by rejuvenescence and growth rings only. Root-like processes rare. Septa numerous, acanthine, short, set in continuous lamellar sclerenchyme, forming a stereozone 2 mm. wide; tabulae thin, complete or incomplete.

Five specimens which seem to be referable to this species are from near Bird Rock, in the Bird Rock Member of the Bell Point Limestone; they show the characteristic lack of septal furrows on the epitheca (an unusual feature in solitary *Tryplasma*) but are somewhat smaller than the types from Wellington Caves, N.S.W.

Tryplasma murrayi Etheridge, 1899, p. 32

Tryplasma? murrayi Etheridge, 1907, p. 93.

Type Material. Geol. Surv. Vic., Waratah Bay, near Wilson's Promontory, S.E. Victoria.

Diagnosis. Corallum probably phaceloid but manner of increase unknown. Corallites long, cylindrical, straight and in bundles; diameter 11 mm.; interseptal ridges flat; stereozone narrow; acanthine septa equal, short, about 50; tabulae complete or incomplete.

I have seen only one specimen, NM P15412, from Bell Point, not *in situ*; this does not permit me to add anything to Etheridge's description.

Tryplasma sp.

Three small, slenderly conical coralla with smooth epitheca (diameter up to 5 mm. at floor of calice), a few root-like processes, complete tabulae and short acanthine septa may be young specimens of *T. wellingtonense*, but do not seem to expand in diameter sufficiently rapidly for that species, and are referred to herein as *Tryplasma* sp. They are known from the Bird Rock Member of the Bell Point Limestone near Bird Rock.

ORDER TABULATA

Family FAVOSITIDAE Dana, 1846

Subfamily FAVOSITINAE Dana, 1846

Genus **Favosites** Lamarck, 1816

Favosites goldfussi d'Orbigny, 1850; Jones, 1936, p. 19. (Pl. VIII, figs. 19, 20)

A tabular colony from the Bird Rock Member of the Bell Point Limestone from Bird Rock shows the characteristic ragged corallite wall, with mural pores not sharply bounded and sometimes merging with irregular holey imperfections. Small pieces of colonies are known from the Kiln Member, on the north side of the Old Kilns. A specimen with corallites 2 mm. in diameter comes from Bell Point (GSV 20083).

Favosites nitidus Chapman; Hill and Jones, 1940, p. 198. (Pl. IX, figs. 25a, 25b)

A typical specimen, UQ F17109, was collected from Point Grinder.

Favosites ?ovatiporus Hill and Jones, 1940 var. (Pl. VIII, figs. 21, 22)

Four specimens from the Bird Rock Member of the Bell Point Limestone from Bird Rock bear notable resemblances to *F. ovatiporus* but differ in possessing septal spines; one differs in having slighlty larger corallites, and two in having slightly smaller corallites.

P.15424 Nat. Mus., Melbourne, has, like the type, polyhedric corallites 0·75 to 1·5 mm. in diameter, the majority being 1 mm., slightly thickened; also, the tabulae are distant and the oval mural pores are in one series in the middles of the faces. The pores are however rather smaller than is typical, their centres about 1 mm. apart; also, septal spines occur, thorn-like mostly, thickening at the base and directed slightly upwards from the horizontal, about eight around a corallite, a few being base to base in neighbouring corallites. In MU 2036 and UQ F17088 the corallites are smaller, 0·5 to 0·1, average 0·75 mm. In UQ F17095 the corallites are larger, up to 2 mm. in diameter, and the septal spines are shorter and quite horizontal, not base to base in neighbouring corallites. The oval pores in this specimen are slightly larger than those in the others.

A tentative determination only is made, in view of the small number of specimens. *F. ovatiporus* is known elsewhere in the Lower Devonian Garra Beds of N.S.W. and the ?Lower Devonian Loyola Limestones of Victoria.

Favosites aff. **bryani** Jones, 1937; Hill, 1950, p. 150. (Pl. IX, figs. 23, 24)

F. bryani typically has thick-walled (0·125 mm.) polygonal corallites 1 mm. in diameter, with a single median row of round mural pores (0·25 mm. in diameter and 0·5 mm. between centres) in each face and with the fibres of the septal trabeculae at the upper and sometimes the lower rims of pores grouped in long sharp-edged eaves-like squamulae; discrete septal spines also occur at the sides of the mural pores. Tabulae are numerous, up to 18 in 5 mm., usually complete and horizontal, sometimes inclined or sagging and suspended from squamulae.

MU 2040, from 200 yards along the coast from Mushroom Rock, differs from the type of *F. bryani* in having slightly larger corallites, 1 to 1·5 or even 1·75 mm. in diameter, with more incomplete tabulae, and the centres of the mural pores 0·8 mm. apart. UQ F17106, from south of Bell Point, differs in having smaller corallites, average 0·8 mm. and more distant, complete tabulae, thus approaching *F. nitidus*.

UQ F17111, from the mudstones with plants towards Cape Liptrap, differs in having corallites with rounded lumina due to thickening of the walls at the angles and in having squamulae horizontal rather than upwardly projecting; such a direction is characteristic of *F. pluteus* Hill from the Couvinian limestones of Buchan, but in the Liptrap specimen the squamulae are dilated at their bases like those of *F. bryani*. This individual is thus in some ways intermediate between *F. bryani* and *F. pluteus*.

Three irregular globular small colonies from somewhat below the ostracod limestone south-west of Hughes Jetty, Waratah Bay, have corallites of average diameter 0·6, 0·75 and 0·8 mm. respectively; the mural pores are very large in the corallum with smallest corallites, being up to 4 mm. diameter, and occupying the whole width of a face. These are doubtfully grouped with *F. bryani*.

Genus **Thamnopora** Steininger, 1831; Hill, 1953

Thamnopora angusta Lecompte, 1939, p. 115. (Pl. IX, figs. 26a, 26b, 26c)

Cylindrical stems 8 to 10 mm., simple or forked, with polygonal calices opening perpendicularly or with slight obliquity 0·75 to 1 mm. in diameter; corallites widening very little in their course with walls moderately thick throughout; pores 0·2 mm. in diameter.

In the Bird Rock Member with *Amphipora* of the Bell Point Limestone north and west of Bird Rock many cylindrical fragments of stems occur which differ from the Belgian Givetian types only in the slightly greater thickness of the walls in the periphery of the branch relative to their thickness in the axial parts. *T. angusta* is known from the Givetian *Amphipora* Limestone near the base of the Pillara Limestone in the West Kimberleys, W.A.

?**Thamnopora** sp. (Pl. IX, figs. 27a, 27b, 27c)

One fragment of a cylindrical branch 7-8 mm. in diameter collected from the Bird Rock Member of the Bell Point Limestone west of Bird Rock has calices opening somwhat obliquely or perpendicularly less than 0·5 mm. in diameter; the calices of some are elongate, others open into any one or sometimes two of their neighbours by a wide canal possibly the work of a boring organism, so that the double calices simulate one very elongate calice and a vermiculate appearance is given to the surface of the branch. The corallites in the axial parts are polygonal or partly rounded in section; the walls are thick throughout, so much so that the corallite may be filled entirely except for the ?bored canals. Tabulae are not seen, nor septal spines, but mural pores are frequent.

The relations of this specimen are uncertain; the corallites are too small for reference to *T. angusta*; possibly it is related to *Scoliopora* rather than to *Thamnopora*, but more material is necessary.

Genus **Striatopora** Hall, 1851; Hill, 1953

?**Striatopora** sp. (Pl. IX, figs. 28a, 28b)

Two fragments from the Bird Rock Member of the Bell Point Limestone are doubtfully included in *Striatopora*.

The branches are tapering, circular in section, up to 15 mm. observed. The corallites are up to 2 mm. in diameter, and polygonal, with walls 0·25 to 0·3 mm. thick in the axial parts of the branch. The corallites curve to open approximately perpendicularly to the surface of the branch, the steepest part of the curve being about 2 mm. from the surface. In a peripheral zone 2 mm. wide the walls are so thickened as to fill the corallite, and just inside this the tabulae may be thickened. The minute structure of the thickened walls is unfortunately obscured, but it may well have been striatoporoid. The tabulae are distant axially, but become closer peripherally. Mural pores are frequent, circular, 5 in a space of 3 mm., and 0·13 mm. wide.

Subfamily ALVEOLITINAE Duncan, 1873

Genus **Alveolites** Lamarck, 1801

Alveolites ?stamineus Hill, 1950, p. 144. (Pl. IX, fig. 29)

A very small fragment of *Alveolites* from the Kiln Member of the Bell Point Limestone of Station G, north side of Old Kilns, Waratah Bay, is doubtfully referred to *A. stamineus*. The corallites are smaller (average height 0·31 mm.) and apparently, from the oblique section available, less semilunar and more flattened in section than is typical; but not so much so as in *A. lemniscus* Smith, a European species from the *Spirifer cultrijugatus* beds of Fourmies. Mural pores are present at the angles; tabulae are rare and septal spines are not observed.

Family HELIOLITIDAE Lindström, 1873

Genus **Heliolites** Dana, 1846

Heliolites daintreei Nicholson and Etheridge, 1879; Jones and Hill, 1940, p. 199. (Pl. IX, fig. 30)

Small flattened globular or flattened hemi-spherical colonies less than 30 mm. in diameter occur in the Bird Rock Member of the Bell Point Formation north of Bird Rock. Two of these are of the fourth group described by Jones and Hill characteristic of Silurian and early Devonian faunas; another is without trace of septa and has walls of tabularia and tubuli considerably thickened.

Family AULOPORIDAE Edwards and Haime, 1851; Lecompte, 1939, p. 175

Subfamily AULOPORINAE Edwards and Haime

Genus **Aulopora** Goldfuss, Lecompte, 1939, p. 175

Aulopora cf. **conglomerata** Goldfuss, 1829; Hill, 1950, p. 156

One specimen, from the Bird Rock Member of the Bell Point Formation, west of Bird Rock, differs from those Buchan specimens described by Hill (1950, p. 156) in having some corallites longer than 3 mm. without an offset being produced, at least on the side of the branch visible on the weathered surface. Another, from somewhat below the ostracod limestone south-east of Hughes Jetty, encrusting *Mictophyllum*, is more typical.

Subfamily Syringoporinae de Fromentel, 1861

Genus **Syringopora** Goldfuss, 1826

Syringopora flaccida Hill, 1950, p. 157. (Pl. IX, figs. 31a, 31b)

Two specimens from the Bird Rock Member of the Bell Point Limestone north of Bird Rock appear to belong to this species though many corallites have their stereozone thicker than 0·2 mm. the characteristic thickness in the Cave Limestone, Buchan.

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Explanation of Plates

PLATE VI

Fig. 1.—*Phillipsastrea maculosa* Hill. UQ F17110, mudstones with plants towards C. Liptrap. Thin sections × 2, *a* transverse, *b* vertical.

Fig. 2.—*Hexagonaria stevensi* (Chapman). UQ F17117, Bell Pt., thin sections × 2, *a* transverse, *b* vertical.

Fig. 3.—*Hexagonaria approximans* (Chapman). Holotype, Nat. Mus. Melb. 1247, Cooper's Ck., Thomson R., Vic., Devonian; thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 4.—*Hexagonaria* aff. *approximans* (Chapman). UQ F17115, Bell Pt., thin sections × 2, *a* transverse, *b* vertical.

Fig. 5.—*Disphyllum ?goldfussi* (Geinitz). Nat. Mus. Melb. P15405-6, *Palaeosolen* band of Bell Pt., thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 6.—*Disphyllum* sp. MU 2025, somewhat below the ostracod limestone south-east of Hughes Jetty, thin sections × 1·8, *a* transverse, *b* vertical.

Fig 7.—*Disphyllum* sp. MU 2027, somewhat below the ostracod limestone south-east of Hughes Jetty, thin transverse section × 1·8.

PLATE VII

Fig. 8.—*Mictophyllum cresswelli* (Chapman). UQ F17134, near edge of Devonian belt, west of Mushroom Rock, thin sections × 1.8, *a* transverse, *b* vertical.

Fig. 9.—*Mictophyllum cresswelli* var. *cylindricum* nov. Holotype, MU P4, Bell Pt., thin sections × 2, *a* transverse, *b* vertical.

Fig. 10.—*Mictophyllum* sp. MU 2023, somewhat below ostracod limestone south-east of Hughes Jetty, thin sections × 1.8, *a* transverse, *b* vertical.

Fig. 11.—*Mictophyllum* sp. or *Disphyllum* sp. UQ F17099, north of Bird Rock, thin transverse section × 1.8.

Fig. 12.—*Heliophyllum pinguiseptatum* sp. nov. Holotype, MU 2042, mudstones with plants towards C. Liptrap, thin sections × 2, *a* and *c* transverse, *b* vertical.

Fig. 13.—*?Pseudamplexus* sp. MU 2031, Station G, north side of Old Kilns, Kiln Member, Bell Pt. Limestone, thin sections × 1.8, *a* transverse, *b* vertical.

Fig. 14.—*Lyrielasma ?subcaespitosum* (Chapman). UQ F17101, north of Bird Rock, thin sections × 1.8, *a* transverse, *b* vertical.

PLATE VIII

Fig. 15.—*Spongophyllum serratum* sp. nov. Holotype, UQ F17100, north of Bird Rock, thin sections × 1.8, *a* transverse, *b* vertical.

Fig. 16.—*Tryplasma wellingtonense* Etheridge, UQ F17090, north of Bird Rock, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 17.—Rugosa gen. et. sp. indet., Nat. Hist. Melb., P15407, *Palaeosolen* band, Bell Pt., thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 18.—Rugosa gen. et. sp. indet., Nat. Mus. Melb., P18411, '*Euomphalus*' region, Bell Pt., thin transverse section × 1·8.

Fig. 19.—*Favosites goldfussi* d'Orbigny. UQ F17094, north of Bird Rock, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 20.—*F. goldfussi.* MU 2032, Station G, north side of old Kilns, Kiln member, Bell Pt. Limestone, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 21.—*Favosites ?ovatiporus* Hill and Jones, ?var. MU 2036, west of Bird Rock, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 22.—*F. ?ovatiporus* ?var. UQ F17095, north of Bird Rock, thin sections × 1·8, *a* transverse, *b* vertical.

PLATE IX

Fig. 23.—*Favosites* aff. *bryani* Jones. MU 2040, 200 yards along coast from Mushroom Rock, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 24.—*F.* aff. *bryani.* MU 2028, somewhat below ostracod limestone, south-east of Hughes Jetty, thin section × 1·8.

Fig. 25.—*Favosites nitidus* Chapman. UQ F17109, Pt. Grinder, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 26.—*Thamnopora angusta* Lecompte. UQ F17102, north of Bird Rock, thin sections × 1·8, *a* transverse, *b* tangential, *c* vertical.

Fig. 27.—?*Thamnopora* sp. MU 2037, west of Bird Rock, thin sections × 1·8, *a* transverse, *b* tangential, *c* vertical.

Fig. 28.—?*Striatopora* sp. MU 2038, west of Bird Rock, thin sections × 1·8, *a* transverse, *b* vertical.

Fig. 29.—*Alveolites* ?*stamineus* Hill. MU 2033, Station G, north side of Old Kilns, Kiln Member, Bell Pt. Limestone, thin section × 1·8.

Fig. 30.—*Heliolites daintreei* Nicholson and Etheridge. UQ F17086, north of Bird Rock, thin transverse section × 1·8.

Fig. 31.—*Syringopora flaccida* Hill. UQ F17113, Bell Pt., thin sections × 1·8, *a* transverse and oblique, *b* vertical.